

Aero-Space Technology Enterprise

Mission

The Aero-Space Technology (AST) Enterprise mission is to pioneer the identification, development, verification, transfer, application, and commercialization of high-payoff aerospace technologies. Research and development programs conducted by the Enterprise contribute to national security, economic growth, and the competitiveness of American aerospace companies. The Enterprise plays a key role in maintaining a safe and efficient national aviation system and enabling an affordable, reliable space transportation system. The Enterprise directly supports national policy in both aeronautics and space as directed in the President's Goals for a National Partnership in Aeronautics and Research Technology, the National Space Policy, and the National Space Transportation Policy.

Implementation Strategy

The Enterprise manages a clearly defined portfolio of technology investments to ensure alignment with national policy, Agency goals, customer requirements, and budget availability. The investment strategies are focused on issues associated with future aviation and space systems. Enterprise objectives are outcome-focused and "stretch" beyond our current knowledge base. The outcome-focused nature of the objectives projects a preferred end-state within the air and space transportation systems. Designated Lead Centers have been assigned the responsibility to manage the implementation and execution phases of the technology programs. Enterprise programs are often conducted in cooperation with other Federal agencies, primarily the Federal Aviation Administration and the Department of Defense. These partnerships take advantage of the national investment in aeronautics and astronautics capabilities and eliminate unnecessary duplication.

The Enterprise supports the maturation of technology to a level such that it can be confidently integrated into current and new systems. In most cases, technologies developed by the Enterprise can be directly transferred to the external customer.

Enterprise Resource Requirements

The President has requested the following budget for FY 1999 to FY 2005 to support the accomplishment of AST goals:

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>
NOA \$M	1,339	1,125	1,193	1,549	1,949	2,245	2,303
CS FTE	4,227	4,227	4,414	4,463	4,576	4,564	4,537

Performance Measures

The following Targets have been established in support of the Enterprise's Strategic Goals and accompanying Objectives; the noted time horizons of 10, 15 and 25 years for these objectives correspond to 2007, 2012 and 2022, respectively:

Global Civil Aviation Goal — Develop an environmentally friendly global air transportation system for the next century of unquestioned safety that improves the Nation's mobility.

Objective - Reduce the aircraft accident rate by a factor of 5 within 10 years and by a factor of 10 within 25 years. (the reference baseline is Federal Aviation accident statistics for 1993 through 1996).

- Complete 75% of the conceptual designs of systems for preventing and mitigating accidents (programmatic performance indicators in appendix), and demonstrate tools for accident analysis and risk assessment; indicators include information data base and tool development, system architecture definition and evaluation, as well as ground and flight tests. (Target 1R1)

Objective - Reduce Emissions of future aircraft by a factor of three in 10 years and by a factor of five within 25 years. (the reference baseline is International Civil Aviation Organization 1996 emissions standards).

- Complete one system level technology benefit assessment, one component concept selection and one new material system; indicators include a technology benefit assessment, advanced concepts definition and selection, development of advanced materials and design methods. (Target 1R2)

Objective – Reduce perceived noise levels of future aircraft by a factor of two in 10 years, and by a factor of four in 25 years. (the reference baseline is representative 1997 production aircraft).

- Complete large-scale demonstration of a 2-5 decibel reduction in aircraft noise based on 1997 production technology, and initial assessments of concepts offering additional reduction; indicators are results of large scale component ground tests and analytical noise predictions, respectively. (Target 1R3)

Objective – While maintaining safety, triple the aviation system throughput in all weather conditions within 10 years (the reference baseline is 1997 operational data from the nation's top 64 airports).

- Complete the civil tiltrotor project by validating databases for contingency power, flight paths, and noise reduction, as well as complete at least one demonstration of an airspace management decision support tool; indicators include demonstrations of decision support and communication tools, as well as design databases. (Target 1R4)

Revolutionary Technology Leaps Goal – Revolutionize air travel and the way in which air and space vehicles are designed, built, and operated.

Objective – Invigorate the general aviation industry, so it can deliver 10,000 aircraft annually within 10 years, and 20,000 aircraft annually within 25 years.

- Complete the Advanced General Aviation Transport Experiments project by validating transportation system concepts through flight test and publish design guidelines; indicators include simulations and flight tests, and published design guidelines and standards. Also establish at least one partnership agreement on Small Aircraft Transportation System program. (Target 1R7)

Objective – Provide next generation design tools to increase design confidence, and cut the development cycle time for aircraft in half within 10 years (the reference baseline is representative 1997 industry timeframes).

- Develop at least three new design tools and accomplish at least four demonstrations of advances in computation and communications; indicators include computer testbed demonstrations, real-time remote access of data, and new design methods. (Target 1R8)

Objective – Provide next generation experimental aircraft to increase design confidence, and cut the development cycle time for aircraft in half within 10 years.

- Demonstrate two new concepts in flight and identify five new concepts for further examination; indicators include vehicle development, flight tests and systems analyses of advanced concepts. (Target 1R9)

Space Transportation Goal – Achieve the full potential of space for all human endeavor through affordable space transportation

Objective – Reduce the payload cost to low-Earth orbit by an order of magnitude, from \$10,000 to \$1,000 per pound, within 10 years, and by an additional order of magnitude within 25 years.

- Complete assembly of the third X-34 test vehicle, demonstrate 75% of supporting technology developments (programmatic performance indicators in appendix), and complete competitive solicitations for expanded 2nd generation reusable launch vehicle efforts; indicators for supporting technology development include both flight tests and ground tests. (Target 1R10)

Objective – Reduce the cost of interorbital transfer by an order of magnitude and travel time for planetary missions by a factor of two within 15 years (the reference baseline is representative 1997 systems).

- Commence X-37 vehicle assembly, and complete one Pathfinder flight experiment. (Target 1R11)

Research and Development Services Goal – Enable, and as appropriate provide, on a national basis, world-class aerospace R&D services, including facilities and expertise

Objective – Provide world-class aerospace research and development services, facilities and expertise.

- Continue the solicitation of customer feedback on the services, facilities and expertise provided by the Aero-Space Technology Enterprise; indicators include two customer survey instruments utilized by the Aero-Space Technology Enterprise, along with documented cases of new technologies transferred to industry and other government agencies. (Target 1R12)
- Continue the implementation of current education outreach plans, and establish new plans for all new program activities initiated in FY 01; indicators include examples of educational outreach activities for current plans and the planning documentation for new programs. (Target 1R13)

Internal Assessment

The Aero-Space Technology Enterprise regularly reviews its progress on achieving its performance targets using NASA's established policies and procedures for program and project management. Evaluation is provided by the governing Program Management Council, either at the Agency-level or at the designated Lead Center, which meet at least quarterly to execute their oversight responsibilities. The AST Enterprise also relies on the extensive Safety, Quality, and Reliability processes and Center organizations to assure that performance in our facilities is maintained to standards appropriate for research and technology development operations.

External Assessment

The Aero-Space Technology Committee of the NASA Advisory Council will conduct annual assessments of the progress made by the OAT Enterprise in achieving its near-term technology objectives. This committee, and its nine technical subcommittees consisting of nearly 150 members from other government agencies, industry and academia that meet two to three times a year, will provide a qualitative progress measurement (Green, Yellow, or Red). "Green" will indicate that the objective was met; "Yellow" will indicate a concern that an objective was not fully accomplished; and "Red" will indicate that events occurred that prevented or severely impaired the accomplishment of the objective. The assessment will include commentary to clarify and supplement the qualitative measures.

Aero-Space Technology Enterprise FY 01 Performance Plan

Strategic Plan Goal	Strategic Plan Objective	01#	FY 01 Targets	FY 01 Indicator Characterization
Global Civil Aviation	Reduce the aircraft accident rate by a factor of 5 within 10 years and by a factor of 10 within 25 years.	1R1	NASA's research stresses aviation system monitoring and modeling, accident prevention and accident mitigation. The performance target is to complete 75% of the conceptual designs of systems for preventing and mitigating accidents (programmatic performance indicators in appendix), and to demonstrate tools for accident analysis and risk assessment.	FY 01 indicators include information data base and tool development, system architecture definition and evaluation, as well as ground and flight tests.
Global Civil Aviation	Reduce Emissions of future aircraft by a factor of two in 10 years, and by a factor of five in 25 years.	1R2	NASA's research stresses engine technology to reduce the emissions of oxides of nitrogen and carbon dioxide. The performance target is to complete one system-level technology benefit assessment, one component concept selection and one new material system.	FY 01 indicators include a technology benefit assessment, advanced concepts definition and selection, development of advanced materials and design methods.
Global Civil Aviation	Reduce perceived noise levels of future aircraft by a factor of two in 10 years, and by a factor of four in 25 years.	1R3	NASA's research has stressed reducing noise in the areas of engines, nacelles, engine/airframe integration, aircraft interiors and flight procedures. The performance target is complete large-scale demonstration of a 2-5-decibel reduction in aircraft noise based on 1997 production technology, and initial assessments of concepts offering an additional 3-decibel reduction.	FY 01 indicators are results of large-scale component ground tests.
Global Civil Aviation	While maintaining safety, triple the aviation system throughput in all weather conditions within 10 years	1R4	NASA's research stresses operations systems for safe, efficient air traffic management and new aircraft configurations for high productivity utilization of existing runways. The performance target is to complete the civil tiltrotor project by validating databases for contingency power, flight paths, and noise reduction, as well as complete at least one demonstration of an airspace management decision support tool.	FY 01 indicators include demonstrations of decision support and communication tools, as well as design databases.

Aero-Space Technology Enterprise FY 01 Performance Plan

Strategic Plan Goal	Strategic Plan Objective	01#	FY 01 Targets	FY 01 Indicator Characterization
Revolutionary Technology Leaps	Invigorate the general aviation industry, so it can deliver 10,000 aircraft annually within 10 years, and 20,000 aircraft annually within 25 years.	1R7	NASA's research stresses operations systems for safe, efficient air traffic management and new aircraft configurations for high-productivity utilization of existing runways. The performance target is to complete the Advanced General Aviation Transport Experiments project by validating transportation system concepts through flight test and publish design guidelines, and to also establish at least one partnership agreement on Small Aircraft Transportation System program.	FY 01 indicators include simulations and flight tests, publishing of design guidelines and standards, signing of new partnership agreements.
Revolutionary Technology Leaps	Provide next-generation design tools to increase design confidence, and cut the development cycle time for aircraft in half in 10 years.	1R8	NASA's research stresses high-speed computing, high-capacity networks, and improved physics-based methods. The performance target is to develop at least three new design tools and accomplish at least four demonstrations of advances in computation and communications.	FY 01 indicators include computer testbed demonstrations, real-time remote access of data, and new design methods.
Revolutionary Technology Leaps	Provide next-generation experimental aircraft to increase design confidence, and cut the development cycle time for aircraft in half in 10 years	1R9	NASA's research stresses affordable flight demonstrations of revolutionary vehicle concepts (low-cost X-Planes) to accelerate technology advances in laboratory research, new design tools and advanced simulation. The performance target is to demonstrate two new concepts in flight and identify five new concepts for further examination.	FY 01 indicators include vehicle development, flight tests and systems analyses of advanced concepts.
Space Transportation	Reduce the payload cost to low-Earth orbit by an order of magnitude (from \$10,000 to \$1,000 per pound) within 10 years, and by an additional order of magnitude within 25 years.	1R10	NASA's research stresses highly reliable, fully reusable configurations, advanced materials and innovative structures. The performance target is to complete assembly of the third X-34 test vehicle, and demonstrate 75% of the technology developments (programmatic performance indicators in appendix) for reusable launch vehicles.	FY 01 indicators include vehicle development, flight tests and ground tests of advanced technologies.

Aero-Space Technology Enterprise FY 01 Performance Plan

Strategic Plan Goal	Strategic Plan Objective	01#	FY 01 Targets	FY 01 Indicator Characterization
Space Transportation	Reduce the cost of interorbital transfer by an order of magnitude and travel time for planetary missions by a factor of two within 15 years.	1R11	NASA's research stresses technology for reusable, long-life, high-power electric and advanced, clean chemical engines for Earth orbital transfer and breakthrough propulsion, precision landing systems and aerocapture systems for planetary exploration. The performance target is to commence X-37 vehicle assembly, and complete one Pathfinder flight experiment.	FY 01 indicators include flight vehicle development progress and conduct of flight experiments.
Research & Development (R&D)	Provide world-class aerospace research and development services, facilities and expertise	1R12	Continue the solicitation of customer feedback on the services, facilities and expertise provided by the Aero-Space Technology Enterprise	FY 01 indicators include two customer survey instruments utilized by the Aero-Space Technology Enterprise, along with documented cases of new technologies transferred to industry and other government agencies.
Research & Development (R&D)	Provide world-class aerospace research and development services, facilities and expertise	1R13	Continue the implementation of current education outreach plans, and establish new plans for all new program activities initiated in FY 01.	FY 01 indicators include examples of educational outreach activities for current plans and the planning documentation for new programs.

AST FY01	AERO-SPACE FOCUSED											AERO-SPACE BASE R&T								
	Budget Category	Aviation System Capacity	Aviation Safety Technology	High Performance Comput'g & Comm.	Ultra Efficient Engine Technology	Small Aircraft Transportation System	Quiet Aircraft Technology	X-33	X-34	Future-X	2nd Generation RLV	Operations Systems	Flight Research	Information Technology	Propulsion & Power	Rotorcraft	Vehicle Systems Technology	Space Transfer & Launch Technology	Commercial Technology	R&PM
Performance Target																				
Aviation Safety (1R1)			X									X		X	X	X	X			X
Environmental Compatibility - Emissions (1R2)				X									X		X					X
Environmental Compatibility - Noise (1R3)							X										X			X
Affordable Air Travel - Throughput (1R4)		X											X	X						X
General Aviation Revitalization (1R7)						X									X		X			X
Next-Generation Design Tools (1R8)				X										X		X	X			X
Next-Generation Experimental Aircraft (1R9)													X		X		X			X
Space Access (1R10)								X	X	X	X			X	X		X	X		X
In-Space Transportation (1R11)										X	X							X		X
R&D Services - Customer Feedback (1R12)																				X
R&D Services - Education Outreach (1R13)																				X